NUI Galway
OÉ Gaillimh

Autumn Examinations 2013/ 2014

Exam Code(s)	4BCT1
Exam(s)	4th Year Examination Computing Science and IT

Module Code(s)	CT421
Module(s)	Artificial Intelligence

Paper No.	1
Repeat Paper	No

External Examiner(s)	Professor Liam Maguire
Internal Examiner(s)	Professor G Lyons
	Dr. M Madden
	*Dr. C Mulvihill
	*Dr. F Smith

Instructions: Answer 2 questions from each section. All questions will be marked equally. Use a separate answer book for each section.

Duration	2 hours
No. of Pages	3
Discipline(s)	IT
Course Co-ordinator(s)	

Requirements:

MCQ	Release to Library: Yes ☐ No ☐
Handout	None
Statistical/ Log Tables	None
Cambridge Tables	None
Graph Paper	None
Log Graph Paper	None
Other Materials	None
Graphic material in colour	Yes ☐ No ☐

PTO

Section A

1

    a) What are the advantages of using fuzzy logic instead of Boolean logic? (5 marks)

    b) What possible methods of fuzzification are there? (5 marks)

    c) What is the purpose of defuzzification? (5 marks)

    d) Describe how fuzzy numbers are propagated through fuzzy rule based systems. (5 marks)

    e) How does Fuzzy Logic soften the boundaries between rules? (5 marks)

2

    a) Give 5 different kinds of uncertainty that can occur in data. (5 marks)

    b) How does Mycin handle uncertainty? Give a couple of sample rules and show how the uncertainty is handled. (15 marks)

    c) How does GDE detect faults in electrical circuits? (5 marks)

3

    a) Explain the terms forward and backward chaining. Give an example of when the use of each of them would be appropriate.
    (10 marks)

    b) Describe each of the following. Highlighting their advantages and disadvantages:
    i) Depth first search
    ii) Breadth first search
    iii) Bounded depth first search
    iv) Depth first search with iterative deepening
    v) Heuristic search
    (15 marks)

Section B

4
    (a) What do you understand by the term 'greedy algorithm'? (5 marks)
    (b) Consider the following graph. A is connected to B. A is connected to C. B is connected to A. B is connected to D. C is connected to A. C is connected to E. D is connected to B. D is connected to F. E is connected to C. E is connected to F. F is connected to D. F is connected to E. What in your view is the minimal number of colours needed to colour this graph? (8 marks)
    (c) Show how when considering the ordering A, B, C, D, E, F of the vertices in the above graph, a greedy algorithm will find this minimal number, and find one other ordering where it will not. (12 marks)

5
    (a) In the context of genetic algorithms, what do you understand by the term 'evolving a strategy'? (5 marks)
    (b) Consider the following 10 by 10 two-dimensional world, based on Mitchell. The world mainly consists of empty squares, but in some squares there are tokens. An agent is required to collect tokens in this environment. The more tokens that are collected, the better. Available actions: Move north, south, east, west, do nothing, move randomly, pick up a token. Discuss the development of a genetic algorithm for evolving strategies in such an environment. (15 marks)
    (c) Is it always clear from inspection of an evolved genome what the strategy is? (5 marks)

6
"Centres like the Centre for Brains, Minds and Machines emerging from MIT, and programmes like the Human Brain Project now beginning in Europe represent two aspects of the future of AI. Of course, other viewpoints exist as well." Discuss this statement. (25 marks)